annual invitational conference of 100 experts who will be asked "to consider the issues and options linking education policy with future economic needs." The forum will also sponsor workshops.

If you accept the hypothesis that the economy will need a large corps of educated, skilled workers, a prescription for more and better science education should be followed. If, on the other hand, you believe the prediction that only a small cadre of educated adults will find rewarding employment, then the argument that the country should expend substantial new money on science education loses force, at least insofar as economic demand is the justification for such an investment. Following the latter prediction, a heavy investment in science education would have to be justified more in terms of the social rather than economic value of scientifically literate citizenry.

Among the specific questions that the Carnegie Forum already has on its agenda are these:

- What should the United States do to respond to the challenge of international economic competition? What changes in current investments in education are needed?
- Will the national economy require a population with skills higher, lower, or about the same as at present? What basic technological skills will be needed by everyone?
- How does national science policy affect education and the economy? Are the recent initiatives (in Congress, at the National Science Foundation, and elsewhere) to improve science education likely to meet the country's needs?
- How do you improve intellectual skills of elementary and high school students in a way that is efficient and cost-effective?
- What special considerations are there for science education for women and racial and ethnic minorities?

One crucial thing to recognize in considering education policy, according to Carnegie officials, is the fact that agreement is not likely to come easily, if at all, but that "policymaking in education cannot be held in abeyance in the hope that differences of view among experts on the economic issues will be resolved." What will be essential, they argue, is that people be willing to change their minds as new data and policy analyses come along—an optimistic hope.

"There is reason to believe that Americans are poised for changes in education policy that will prove in retrospect more dramatic than they have ever experienced," Hamburg says. "If so, the current wave of attention to education is just the beginning."

—BARBARA J. CULLITON

A Push for European Patent Reform

There is pressure from within Europe and from the United States to permit publication of research results before a patent is applied for

Paris. Pressure is growing on European governments, not only from parts of their own patent communities but also from the United States, to introduce new legislation creating a "grace period" for the protection of scientific discoveries. The goal is to change the current situation under which, unlike in the United States, scientific research results cannot be patented in Europe once they have been published in the open literature.

Many of the examples used to support such a change are being drawn from the field of genetic engineering. The introduction of an international grace period of perhaps 6 months after publication, for example, is the first of a list of recommendations made in a report on patent protection in biotechnology soon to be published by the Organization for Economic Cooperation and Development (OECD) in Paris.

Its proposal is already proving controversial. There is no clear consensus in Europe's industrial community on whether the change is needed, the main pressure tending to come from medium-sized companies and patent attorneys—as well as university patent officers—rather than from large chemical or pharmaceutical manufacturers. Many national patent agencies are reluctant to introduce new rules into a field that is already highly complex and appears to operate moderately efficiently. Officials in other institutions, such as the European Economic Commission in Brussels, argue that if European countries are required to harmonize their practices with those in the United States, then the United States should in return be persuaded to change those aspects of its domestic patent legislation which currently discriminate against foreigners.

The main focus of the current debate is the Geneva-based World Intellectual Property Organization (WIPO). This is the United Nations body responsible for administering a number of international patent treaties, including the Paris convention of 1883, which provides the basic framework for international patent law and now has 94 signatories, including all member countries of the OECD and of the Socialist Bloc.

Largely at the prompting of the United States, but with support from officials from some European countries as well, WIPO has for several years been laying the groundwork for the possible creation of a new international treaty whose signatories would each agree to accept a grace period between the publication of scientific results and the date by which a patent application based on these results must be filed.

Ludwig Baeumer, the director of WIPO's Industrial Property Division, points to the wide discrepancy in current practice among those who have signed the Paris convention. Some, such as the United States and Canada, currently acknowledge grace periods (of 1 and 2 years, respectively); others, including Japan and Australia, have shorter grace periods and subject them to strict conditions, such as only covering publications in journals of learned societies.

In contrast, no grace period is allowed in Europe where any publication is counted as a "prior disclosure" that invalidates a subsequent patent application. Indeed, several European countries—notably West Germany and the United Kingdom—who have accepted grace periods in the past gave them up when they became signatories to the European Patent Convention of 1973.

"The result is that some inventors now lose their rights," says Baeumer. "This is particularly true of inventors who do not know they are inventing something, such as scientists who do not identify their results as inventions but prefer to consider them solely as scientific discoveries."

According to Baeumer, WIPO has received a generally positive reaction to a report published last year by a committee of experts proposing an international agreement on grace periods, and next year's budget for the agency is expected to include explicit provisions to support further work toward this goal.

The aim is eventually to hold a diplomatic conference that would lead to the adoption of a treaty and a new "union" of subscribing members. Any country that signed the treaty would thereby indicate its intention to introduce a grace period, although ratification would generally require a change in domestic legislation—a process that Baeumer admits could take several more years.

Still under discussion is whether all countries would agree to respect the same period—6 months is the time usually proposed—or whether the treaty would merely specify a minimum length of time, leaving individual countries who signed the opportunity to retain or introduce longer periods if they wish.

However, there is already agreement that the treaty should specify a single starting date for this period, namely the publication of a scientific result in any member country of the Paris union, not just the one in which the patent was being sought.

Proposals for an international grace period do not meet with unanimous approval. Some countries, such as Canada, which now have a grace period are already talking about the possibility of abandoning it; others, such as the Soviet Union, where the protection of intellectual property is based on different principles, have little enthusiasm.

Wholehearted support, however, has come from a group of patent experts assembled by the Scientific and Technological Policy Committee of OECD, which 3 years ago identified both national and international aspects of patent protection as one of the key policy issues facing the growth of biotechnology in its member countries.

The final version of the committee's report, which includes both the results of a survey conducted among member countries of current patent policies affecting biotechnology and a list of recommendations from its group of experts, is now under review by governments and is expected to be published within the next few weeks.

Its conclusions, however, are said not to differ significantly from those of an earlier draft produced last summer, which heads its list of recommendations with "the need for a grace period at an international level, allowing inventors to submit within a certain time limit a patent claim on an invention, even if they have revealed it already in scientific publication."

The various authors of the report seem united in their enthusiasm. One section prepared by OECD officials, for example, points out that although Stanford University has managed to obtain a U.S. patent on the early genetic engineering work of Stanley Cohen and Herbert Boyer, it was not able to obtain similar rights in Europe since the patent application was made after the research results had been published. "More than anything else the Cohen-Boyer case demonstrated to university researchers the promises of the patent routes, but also the dilemmas which might confront them and the irreparable damage which can come through oversight of elementary patent law," says the draft report.

The enthusiasm is far from universal, however. "We feel that on the political level, people are divided," says Robert Coleman, head of the Intellectual Property Division of the Commission of the European Economic Community in Brussels. "There are some very good arguments why you should not have a grace period, for example, because it decreases the cost and complexity of defending a patent. It is particularly the smaller people who are going to have the most difficulty. In theory they will benefit; but they will also suffer from the fact that there will be greater uncertainty over what is in the public domain and what is not, and uncertainty over who the inventor really is."

Such a move could help each nation turn its strength in basic research into a valuable commercial asset.

Coleman acknowledges that the United States, as evidenced by its moves within WIPO, is clearly interested in seeing a more universal adoption of its own approach, particularly since it would increase the protection given to U.S. discoveries in European markets. But he suggests that there are also changes in U.S. patent law that Europeans would like to see. In particular, he complains of the fact that a U.S. inventor can challenge a foreign patent application by "swearing back" that he made the invention first—even if he did not publish it—but that the foreign applicant cannot use the same procedure in reply if his "inventive activity" occurred outside the United States.

Those hoping for rapid movement feel that the European Commission, by emphasizing the many political hurdles that will have to be crossed before each individual country agrees to change its domestic legislation, is being unduly cautious and conservative in its approach. The time has come, argue individuals such as Friedrich-Karl Beier, director of the Max Planck Institute for Patent Law in Munich and one of the main authors of the OECD report, for the wholehearted endorsement of bolder initiatives, such as the new convention being proposed by WIPO. They point out, for example, that the idea of an international grace period has already been approved by the International Association for the Protection of Industrial Property, a private body that brings together 6000 individuals concerned with patent related questions from 70 different countries. The OECD group of experts similarly report increasing support for their proposals from industry and part of the academic community.

Others question the true depth of this support. Certainly no one European country currently puts the grace period proposal at the top of its own priority list of needed reforms in patent legislation. The topic was not even raised, for example, in a green paper published a year ago by the British government, currently embroiled in the legal complexities of breaking up the previous monopoly position of the government-funded research enjoyed by the BTG (formerly the National Research Development Corporation). And French officials have, so far, shown little enthusiasm either.

Politically, however, the time may prove right for such a change, particularly when European governments are under pressure to do what they can to improve the climate for technological innovation, and the U.S. Office of the Special Trade Representative is also under pressure from Congress to demonstrate the steps it is taking to protect U.S. discoveries in foreign markets.

One possibility currently being canvassed in West Germany, for example, is that changes in international patent law could figure on the agenda of the heads of state of the seven leading industrialized nations when they hold their annual summit in Bonn at the beginning of May. Such a move, it is argued, could help each nation turn its strength in basic research into a valuable commercial asset.—**David Dickson**